The Federal Networking and Information Technology Research and Development (NITRD) Program

Briefing at the Kickoff Meeting for the National Academies Study on the Potential Impact of High-End Computing on Four Fields of Science and Engineering

September 29, 2006

Simon Szykman, Ph.D.

Director

National Coordination Office (NCO) for Networking and Information Technology Research and Development (NITRD)

Overview of the NITRD Program

- **Authorization of the Networking and Information Technology Research and Development (NITRD) Program**
  - High-Performance Computing Act of 1991
  - Next Generation Internet Research Act of 1998
- **NITRD Subcommittee, National Science and Technology Council (NSTC)**
  - Representatives from 14 program agencies + OMB + OSTP + NCO/NITRD
  - Has two Interagency Working Groups (IWGs) and five Coordinating Groups (CGs)
- **Budget of $3.1 billion proposed for FY 2007**

NITRD Program Structure

- **The NITRD Program is organized in technical domains called Program Component Areas (PCAs)**
- **The activities in the PCAs are coordinated through the NITRD Subcommittee of the National Science and Technology Council (NSTC)**
  - Has two Interagency Working Groups (IWGs) and five Coordinating Groups (CGs)
  - Representatives from
    - 14 program member agencies
    - White House Office of Management and Budget (OMB)
    - White House Office of Science and Technology Policy (OSTP)
    - NITRD National Coordination Office

NITRD Program Coordination

White House
Executive Office of the President

Office of Science and Technology Policy

President's Council of Advisors on Science and Technology (PCAST) serving as the **President's Information Technology Advisory Committee (PITAC)**

National Science and Technology Council

Committee on Technology

Committee on Homeland and National Security

National Coordination Office (NCO) for Networking and Information Technology Research and Development

Subcommittee on Networking and Information Technology Research and Development (NITRD)

Subcommittee on Infrastructure

High End Computing (HEC) Interagency Working Group (HEC I&A and HEC R&D)

Cyber Security and Information Assurance (CSIA) Interagency Working Group

Human Computer Interaction and Information Management (HCI&IM) Coordinating Group

Large Scale Networking (LSN) Coordinating Group

High Confidence Software and Systems (HCSS) Coordinating Group

Social, Economic, and Workforce Implications of IT and IT Workforce Development (SEW) Coordinating Group

Software Design and Productivity (SDP) Coordinating Group

NITRD Program Goals

- Assure continued U.S. leadership in computing, information, and communications technologies to meet Federal goals and to support U.S. 21st century academic, industrial, and government interests
- Accelerate deployment of advanced and experimental information technologies to maintain world leadership in science, engineering, and mathematics; improve the quality of life; promote long-term economic growth; increase lifelong learning; protect the environment; harness information technology; and enhance national security
- Advance U.S. productivity and industrial competitiveness through long-term scientific and engineering research in computing, information, and communications technologies

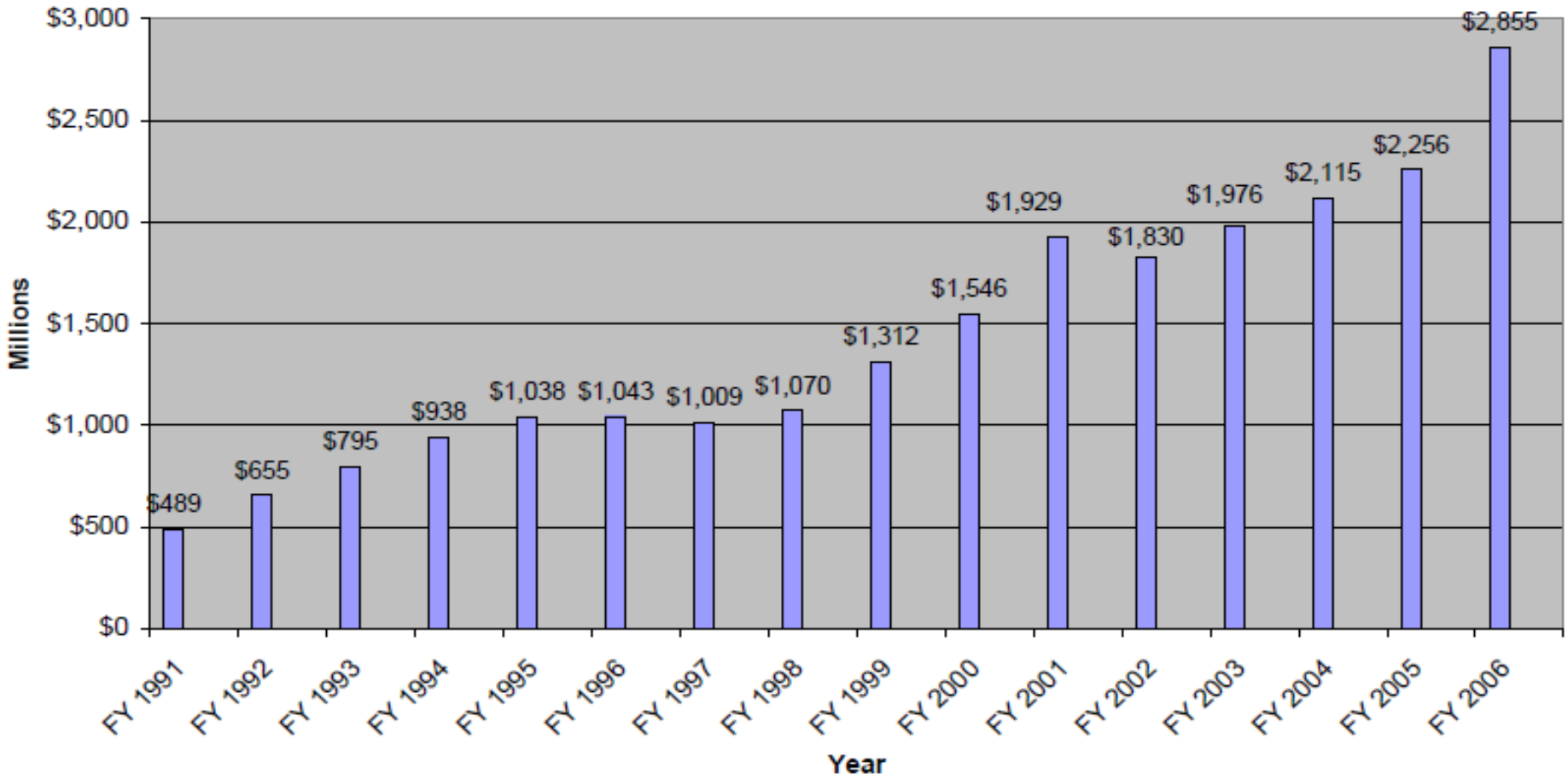
NITRD Member Agencies

- Agency for Healthcare Research and Quality (AHRQ)
- Defense Advanced Research Projects Agency (DARPA)
- Department of Energy/National Nuclear Security Administration (DOE/NNSA)
- Department of Energy/Office of Science (DOE/SC)
- Department of Homeland Security (DHS)
- Environmental Protection Agency (EPA)
- National Aeronautics and Space Administration (NASA)
- National Archives and Records Aministration (NARA)
- National Institutes of Health (NIH)
- National Institute of Standards and Technology (NIST)
- National Oceanic and Atmospheric Administration (NOAA)
- National Security Agency (NSA)
- National Science Foundation (NSF)
- Office of the Secretary of Defense (OSD) and DOD Service Research Organizations

NITRD Participating Agencies

- Central Intelligence Agency (CIA)
- Department of Justice (DOJ)
- Department of State (DOS)
- Department of Transportation (DOT)
- Department of the Treasury (Treas)
- Federal Aviation Administration (FAA)
- Food and Drug Administration (FDA)
- General Services Administration (GSA)
- Technical Support Working Group (TSWG)
- United States Geological Survey (USGS)

NITRD Program Budget History



Source: Annual Supplements to the President's Budget

Agency NITRD Budgets by PCA

FY 2007 Budget Requests (dollars in millions)

		High End Computing Infrastructure & Applications	High End Computing Research & Development	Cyber Security & Information Assurance	Human-Computer Interaction & Information Management	Large Scale Networking	High Confidence Software & Systems	Social, Economic, & Workforce Implications of IT	Software Design & Productivity	
Agency		**(HEC I&A)**	**(HEC R&D)**	**(CSIA)**	**(HCI &IM)**	**(LSN)**	**(HCSS)**	**(SEW)**	**(SDP)**	**Total**
NSF	2006 Estimate	220.3	62.7	57.6	207.4	82.2	41.3	91.1	47.9	810.3
	2007 Request	**272.4**	**64.1**	**67.6**	**220.9**	**84.0**	**51.3**	**92.9**	**50.7**	**903.7**
OSD & DoD Service research orgs.		214.6	9.8	0.6	138.5	141.8	31.2	0.2	6.9	543.7
		186.0	**8.7**	**0.7**	**135.6**	**130.7**	**29.1**	**0.3**	**6.8**	**497.8**
NIH		198.5			188.7	74.9	8.4	12.3	17.9	500.6
		194.7			**183.2**	**74.6**	**8.3**	**12.2**	**17.7**	**490.7**
DARPA			94.1	78.7	174.2	21.3				368.3
			117.7	**81.6**	**233.2**	**33.2**				**465.7**
DOE/SC		104.4	109.1			38.9		3.5		255.8
		135.3	**160.4**			**45.0**		**4.0**		**344.7**
NSA			89.2	14.1		1.0	36.2			140.5
			62.4	**13.3**		**2.3**	**39.9**			**117.9**
NASA		60.3		1.3	2.0	5.7	7.0		1.8	78.1
		63.9		**1.3**	**2.0**	**6.0**	**7.0**		**1.8**	**82.0**
AHRQ					40.1	21.6				61.7
					37.3	**20.0**				**57.3**
NIST		2.3	1.2	9.1	7.8	4.3	9.6		4.6	38.9
		2.3	**1.2**	**11.1**	**9.8**	**4.3**	**9.6**		**4.6**	**42.9**
DOE/NNSA		10.0	15.9			1.6		4.6	3.3	35.4
		9.5	**23.4**			**1.6**		**4.6**	**2.8**	**41.9**
NOAA		11.4	1.9		0.2	0.7			1.6	15.8
		16.4	**1.9**		**0.5**	**2.9**			**1.6**	**23.3**
EPA		3.3			3.0					6.3
		3.3			**3.0**					**6.3**
TOTAL (2006 Estimate)		825.0	383.9	161.3	761.9	393.9	133.6	111.6	84.0	2,855
TOTAL (2007 Request)		**883.8**	**439.9**	**175.5**	**825.4**	**404.5**	**145.2**	**114.0**	**85.9**	**3,074**

Program Component Areas (PCAs)

At the core of the NITRD Program structure are eight technical domains called Program Component Areas (PCAs):

- **Cyber Security and Information Assurance (CSIA) Interagency Working Group (IWG):**
  - Research and advanced development to prevent, resist, detect, respond to, and/or recover from actions that compromise or threaten to compromise the availability, integrity, or confidentiality of computer-based systems such as those in critical infrastructures
- **Human Computer Interaction and Information Management (HCI&IM):**
  - R&D to increase the benefit of computer technologies to humans, particularly the science and engineering R&D community, including cognitive systems, data analysis, information integration, multimodal and automated language translation, robotics, and user interaction technologies

PCAs

- **Large Scale Networking (LSN):**
  - R&D in leading-edge networking technologies, services, and enhanced performance, including new architectures, optical network testbeds, security, infrastructure, middleware, end-to-end performance measurement, grid and collaboration networking tools and services, and engineering, management, and use of large-scale networks for scientific and applications R&D
- **High Confidence Software and Systems (HCSS):**
  - R&D to bolster the Nation's capability and capacity for engineering effective and efficient distributed, real-time, IT-centric systems that are certifiably and inherently dependable, reliable, safe, secure, fault-tolerant, survivable, and trustworthy

PCAs

- **Social, Economic, and Workforce Implications of IT and IT Workforce Development (SEW):**
  - R&D investigating the nature and dynamics of IT and its implications for social, economic, and legal systems as well as the interactions between people and IT devices and capabilities; IT workforce development needs; the role of innovative IT applications in education and training; and transfer of networking and IT R&D results to policymaking and IT user communities
- **Software Design and Productivity (SDP):**
  - R&D leading to fundamental advances in the concepts, methods, techniques, and tools for software design, development, and maintenance that can address the widening gap between the needs of Federal agencies and society for usable and dependable software-based systems, and the ability to produce them in a timely, predictable, and cost-effective manner

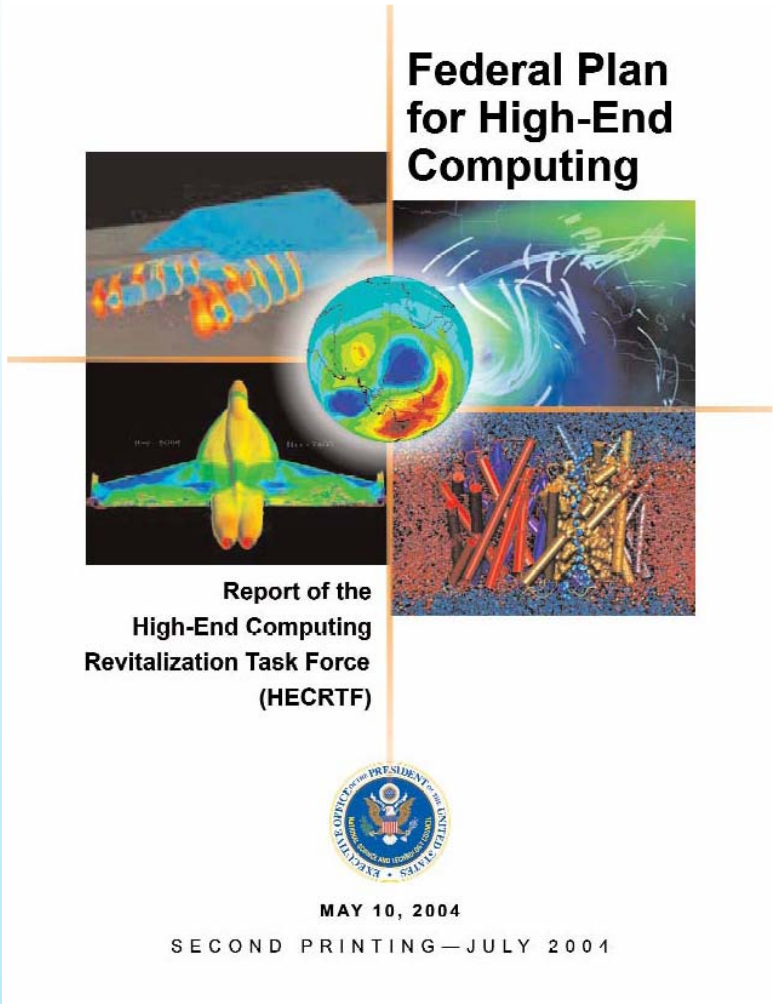
High End Computing PCAs

- **High End Computing (HEC) Interagency Working Group (IWG), with two PCAs:**
  - HEC Infrastructure and Applications (I&A) – Advanced computing systems, applications software, data management, and HEC R&D infrastructure to meet agency mission needs and to keep the United States at the forefront of 21st century science, engineering, and technology
  - HEC Research and Development (R&D) – R&D in hardware (e.g., microarchitecture, memory subsystems, interconnect, packaging, I/O, storage), software (e.g., operating systems, languages and compilers, development environments, algorithms), and systems technologies (e.g., system architecture, programming models) to enable the effective use of high-end systems

High End Computing Budget Highlights

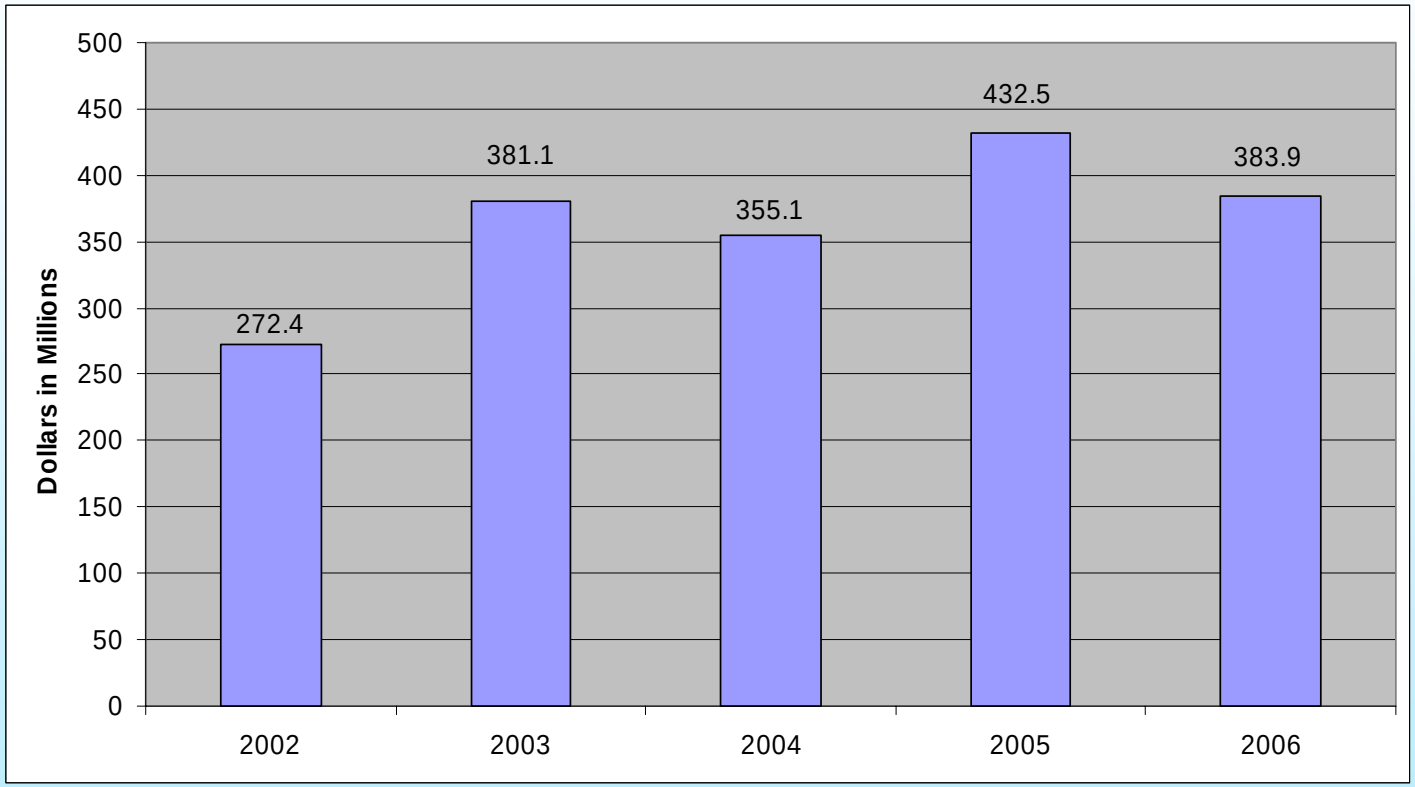
- **New organizations added to budget reporting in 2007**
  - High Performance Computing Modernization Program Office
  - DoD Service research organizations
- **HEC PCAs account for $1.3 billion (over 40%) of the $3.1 billion FY 2007 NITRD budget request**
- **Agency funding for high-end computing**
  - Four agencies account for over 90% of HEC funding
    - DoD (including DARPA and NSA): $375 million
    - NSF: $337 million
    - DOE (including Office of Science and NNSA): $329 million
    - NIH: $195 million
- **FY 2007 NITRD budget request is $219 million higher than FY 2006 estimated spending**
  - HEC PCAs account for over half the increase

High-End Computing Roadmap



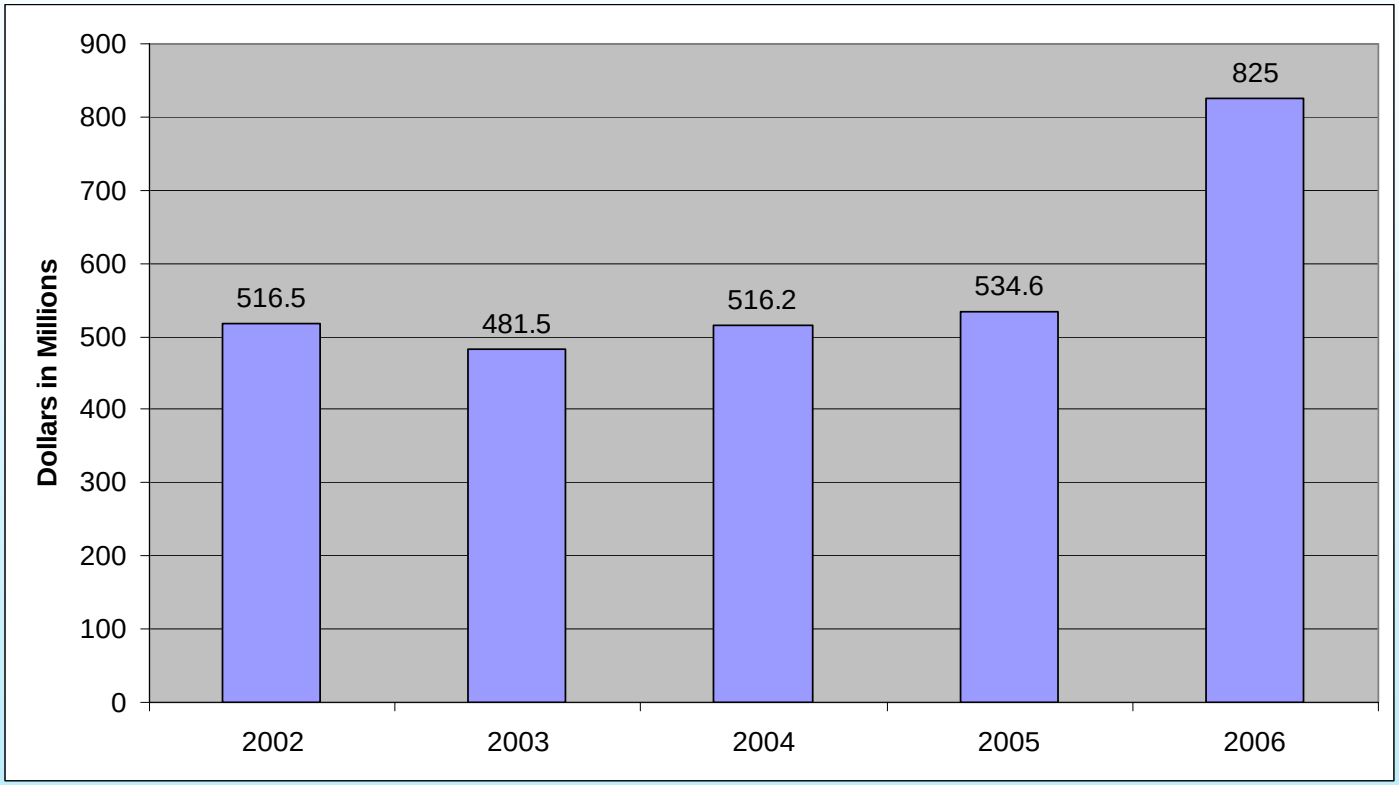
- **R&D in High-End Computing**
- **Resources**
  - Production Systems
  - Leadership Systems
  - Accessibility
- **Procurement Practices**

HEC R&D Five-Year Budget History



FY 2007 HEC R&D Budget Request: $440 Million

HEC I&A Five-Year Budget History



FY 2007 HEC I&A Budget Request: $884 Million

American Competitiveness Initiative (ACI)

- **Calls for a doubling over 10 years of the investment in three Federal agencies — NSF, DOE/SC, and NIST — that support basic research programs in the physical sciences and engineering**
- **All three agencies are NITRD Program members**
- **2007 budget increases exceed the % increase in the overall proposed NITRD Program budget**
  - NSF: ⇧12%
  - DOE/SC: ⇧35%
  - NIST: ⇧10%
  - Collective increase for ACI agencies is $186 million (17% above 2006 estimates)
  - ACI agency budgets accounts for over 85% of the overall NITRD Program budget increase for 2007

Impact of the ACI on HEC

- **NSF**
  - Budget impact: HEC PCA budgets: ⇧$54 million
  - Programmatic impact:
    - Acqusition of a petascale system
    - Acquisition of additional HEC resources
- **DOE/SC**
  - Budget impact: HEC PCA budgets: ⇧$82 million
    - LBNL/NERSC-5 – 100-150TF
    - ORNL/LCF IBM BlueGene/P
    - ORNL/LCF Cray XT3

Comments or Questions?

- More detailed information on the NITRD Program is available in *The FY 2007 Supplement to the President's Budget for the NITRD Program*

- To download a copy of the Budget Supplement or any of our other publications, please visit:

  http://www.nitrd.gov/